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Contract No. N00014-87-C-2354

HUGHES
AIRCRAFT COMPANY
RESEARCH LABORATORIES

(Competitive Award: \$525,603.00)

APPLICATIONS RESEARCH STUDIES OF MICROTUBULES



Monthly Letter Progress Report #2

Period: 12 September 1987 to 11 October 1987

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1. General Objectives and Approach

This contract provides the Hughes Research Laboratories (HRL) funding for the first year of a three year research program to investigate techniques basic to novel applications of lipid microtubules for electro-optical, optical, and sensor devices, and to study the feasibility of such device applications. The overall program has two main areas: (1) The study of ordered microtubules in fluids and films, for applications such as variable transmission windows, IR polarizers, and dichroic filters; (2) The study of ordered attachment of microtubules to surfaces, for applications such as nonlinear optical devices and acoustic detectors. The emphasis in this first year is on the suspension, orientation and electro-optical properties of microtubules in fluids, liquid crystals, and polymers, and on techniques for controlling the orientation and attachment of microtubules to surfaces.

2. Work In The Second Month

Preliminary experiments were made in handling and observing small samples of Cu-coated and Ni-coated microtubules. We found that these could be suspended in an optical cement and then locked into position by ultraviolet polymerization. They could also be suspended in some liquid crystals. In very brief initial experiments we did not yet observe the field alignment effects that we expect to study. We think that we need thicker cells, stronger fields, and better substrate insulation for the electrical fields.

3. Plans For Next Month

We plan to begin systematic experiments on the properties of microtubules in fluids, including hosts such as liquid crystals and monomer mixtures such as UV-polymerizable optical cements. We plan to prepare thicker cells with SiO_2 -coated electrodes for electrical field tests, and we plan to study alignment of the Ni-coated tubules with a stronger magnetic field.

4. Project Status

Costs incurred in the first two months (including our NRL visit and participation in the DARPA Review) will total about \$11.2K at the manufacturing level (corresponding to about \$14.5K sales level). We need to obtain from NRL some additional Ni-coated tubules, and also some bulk lipid material with which to study the controlled aligned growth of microtubules.

1/29/88

CONTRACT EXPENDITURES N00014-87-C-2354

